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Wildlife and Fisheries Information System
Career Management Team Findings for Wildlife and Fisheries Biologists
Training BLM Wildlife and Fisheries Program Personnel
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Preface

The Bureau of Land Management's (BLM's) Wildlife and Fisheries Information System Strategic Plan is the result of a request made by the Washington Office Chief, Division of Wildlife and Fisheries. The Chief directed that a plan be written to explain where the program was and where it was going with respect to automation. The BLM's Service Center in Denver was assigned the lead, and with input from the Wildlife ADP Users Group, produced a document which has evolved from numerous "unofficial" reviews and several "official" reviews.

The Washington Office Divisions of Wildlife and Fisheries (WO-240) and Information Resources Management (WO-770) reviewed the "final" draft in January 1990. Washington Office Instruction Memorandum 90-336 specifically requested that each State Director have their Wildlife and Fisheries Program staffs, IRM staffs, and other knowledgeable individuals review the document with comments due to the BLM Director by March 3, 1990. Concurrently the plan was distributed to several other governmental and nongovernmental agencies for their review. Comments were received and incorporated by members of a team during September 1990. This plan has attempted to capture the ever-changing concepts of Automation, Information Resource Management, and Modernization (AIM).

The Wildlife and Fisheries Information System ***(WFIS)*** Strategic Plan is part of the initial (analysis) phase of the Life Cycle Management (LCM) process. The plan will serve as a "guide" in the development/revision of each of the ***WFIS*** subsystems. The plan will be used as a "supporting" document to subsequent development of a Statement of Need and as a reference document in the development of the Project Charter.

Recommended by:	J. David Almand Chief, Division of Wildlife and Fisheries	5/8/91 Date
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Executive Summary

The Wildlife and Fisheries Information System *(WFIS)* Strategic Plan specifically addresses Automation, Information Resource Management, and Modernization (AIM) within the Bureau's Wildlife and Fisheries Program. This plan will become an integral component of the Bureau's *Fish and Wildlife 2000 - A Plan for the Future.*

The development of an automated information system, while not specifically mentioned within Fish and Wildlife 2000, is absolutely critical to that plan's implementation and success. Being able to analyze and communicate wildlife, fisheries, and special status species issues, values, opportunities, and accomplishments on public land is the primary responsibility of the Wildlife and Fisheries Program personnel and managers. The development and implementation of the Wildlife and Fisheries Information System will allow wildlife and fisheries biologists, botanists, and support personnel to do their jobs faster and more effectively than in the past.

Simply put, the plan addresses four major components: (1) Where are we and how did we get here?; (2) Where do we want to be and by when?; (3) How are we going to get there?; and (4) How will we know if we have achieved our goals?

This strategic plan is designed to identify broad user requirements for the development of an information system; assignments for specific tasks; anticipated target dates; and procedures for developing, testing, releasing, training, and supporting specific subsystems. Each subsystem being described herein is a component of a Relational Data Base Management System (RDBMS). It is anticipated that this plan will carry the program from our current capabilities through the interim period and would become obsolete with the implementation of the Bureau's Target System. The Target System must include full wildlife and fisheries requirements (a total resource based Land Information System), as well as full lands and records and office automation capabilities.

The development and implementation of *WFIS* is fully supported by and in complete compliance with the Bureau's *Master Plan for Automation - A Tactical Management Plan, April 1990.*

Where Are We and How Did We Get Here?

Goal

The goal of the Wildlife and Fisheries Information System Strategic Plan is to automate the Wildlife and Fisheries Program. This automation will allow maximum use of information and data at all levels in the analysis and decision-making process. Automation will also optimize data sharing both internally and externally while being an integral component of the Bureau's Land Information System (LIS). The system is predicated on direct access by the user at all levels, and reliance on personal computers (PCs) and workstations in the Target System. This plan focuses on the present and interim period while preparing for the Target System.

Introduction

This plan describes a comprehensive ***WFIS*** for the Bureau and outlines a strategy for its continued development and implementation. Information system is used here in the broadest sense, and includes publications, training materials, bulletin boards, maps, text files, etc., in addition to alphanumeric and graphic files. Although the emphasis is on automated data processing, computer files cannot be considered separately from other information sources. The information system includes Wildlife and Fisheries Program resource data, as well as program or administrative data. The system described in this plan addresses hardware and software to the extent possible in order to make ***WFIS*** compatible with existing Bureau standards and policy, as well as anticipated or recent decisions regarding configuration, hardware, and software for the interim period and Target System. Documents listed in the Bibliography address policy regarding Target System development and implementation.

Background

A number of relevant events and activities have preceded this plan. These past events and current trends are summarized below.

- **The Bureau's Strategic Plan and Detailed Requirements Definition (DRD)** - The Bureau developed a Strategic Plan for information systems in the mid-70's. This plan identified the types of data and analytical systems that would be required and the data that would be automated. The DRD identified data elements that would be used as part of this system. Both documents contained separate sections describing the wildlife component of the system in detail, but barely addressed analytical systems. The plan identified the need for computer graphics, particularly maps, even though the technology was not available at that time.

- **Integrated Habitat Inventory and Classification System *(IHICS)*** - Following the recommendations of the Strategic Plan, the Wildlife Program staff developed ***IHICS*** for the storage and retrieval of inventory data. This data base was developed in the late 70's and early 80's following passage of the Federal Land Policy and Management Act, when the Bureau was concentrating money and staffing on inventorying public land resources. ***IHICS*** is a data base for storing and retrieving wildlife habitat inventory data. It provides limited analytical capabilities, but does provide user custom-

ized report generating functions. At the time, the BLM Director instructed that all wildlife inventory data was to be stored in an *IHICS* data base. Some field offices objected to the use of *IHICS* for a variety of reasons. Thus, the data collected in these field offices during that period of time was never put into *IHICS* or any other data base; much of that information has subsequently been lost or discarded.

A parallel system for riparian and aquatic data, the Riparian Aquatic Information Data Summary *(RAIDS)* system was developed in the mid-80's. Two other systems, one on threatened and endangered species observations *(TEDS)* and another to record opportunistic wildlife observations *(WORDS)* have only recently been developed. Field use of these *WFIS* subsystems has been limited due to lack of awareness, lack of direction, and limited availability of equipment and training. Recently distributed user guides for these systems (Appendix 1), the availability of the ASPEN/2 software on PCs, and the establishment of a full-time *WFIS* training coordinator at the Phoenix Training Center (PTC) are helping to alleviate this situation. However, a lack of time to devote to automation efforts is still a major problem.

- **The Microcomputerization of the Bureau** - While the Bureau continued to develop and implement several mainframe applications, the age of the microcomputer began in the early 80's. Microcomputers were viewed by some field office employees as a tool they could readily apply. Microcomputers would free them from the need to communicate through telephone lines with the mainframe computer in Denver. Microcomputers also offered freedom to develop and use computer systems without any centralized control, a philosophy consistent with the Bureau trend toward decentralization in general. Thus, the difficult problems of dealing with data standards, data administration, etc., that the Bureau could not resolve at that time were avoided.

- **The Emergence of GIS** - New developments in microcomputers were accompanied by new awareness of developments in Geographic Information Systems (GIS). GIS allows data to be stored, manipulated, and displayed much the same as alphanumeric data, but expressed in a geographic (map) format. Because much of the data that the Bureau deals with is map data, such systems had a great deal of appeal to Bureau field managers and staff. But appeal of GIS also led to some misunderstandings in the early stages of its applications. Many Bureau field employees believed GIS could solve most, if not all, the Bureau's data management problems.

- **Formation of Wildlife ADP Users Group** - In response to the emphasis on GIS, the Wildlife ADP Users Group was formed in 1985. This group has provided recommendations for data base development, reviewed development efforts, recommended acceptance for field use, and provided input and recommendations on ADP issues to the Washington Office (WO) and Service Center (SC).

  Two issues were addressed the first year. One group reviewed inventory data elements identified in the Strategic Plan to determine which of the originally identified elements were still needed and which additional elements were required. Those that were graphic in nature were identified for use in GIS. A second group addressed the needs for graphic elements in habitat modeling. Both groups recommended that the single most important need was a link between alphanumeric data and graphics data. The linkage was developed the following year by the GIS Project Office at the SC. The mechanism, however, remains user-hostile.

  Subsequent meetings of this group have been held since 1986. These meetings have addressed various information and ADP needs, including monitoring, aerial photography, microcomputer uses, productivity analyses, training, bulletin boards, and, most

recently, providing input to this long-term strategic plan. These meetings have proven to be a useful forum for communicating user requirement and application needs in the Wildlife and Fisheries Program throughout the Bureau. This group will continue to meet at least annually and will be extremely valuable during the interim period and as the Target System is developed and brought on line.

- **The Development of ALMRS** - As a followup to the original Strategic Plan, a low-level effort at automating lands and minerals case records also was begun in the early 80's. Beginning in about 1984, this effort received increased attention and funding. This was accompanied by a Bureauwide effort to support and acquire an Automated Land and Mineral Record System (ALMRS).

- **Service Center Reorganization** - In approximately 1986, because the ALMRS and GIS staffs were dealing with overlapping data systems that needed to interact with each other, four branches were reorganized to form the ALMRS-GIS Project Office at the SC.

- **The Integration of Resources** - In late 1986 and early 1987, the Bureau realized that a major ADP component, renewable resources, was not being sufficiently covered by its modernization efforts. The Bureau recognized that in order to support multiple use management, any comprehensive ADP system must include resources.

- **The Concept of a Land Information System (LIS)** - The integration of resources was followed quickly by the emergence of the concept of a Land Information System consisting of ALMRS, Geographic Coordinate Data Base (GCDB), and Automated Resource Data (ARD). The 1988 reorganization of the SC and creation of an LIS staff in the WO were intended to better manage the development of the LIS and provided for improved coordination. The 1989 Information Resources Management (IRM) reorganization study recognized the concept of data administration and created staff positions throughout the Bureau. Several other reports have been completed, dealing with organization, funding, training, impacts of automation, and data management, and actions will surely follow to strengthen the Bureau's capability to deal with the automation process.

- **Other Wildlife and Fish Data Systems** - During the 1980's many other agencies and organizations developed and implemented automated systems for fish, wildlife, rare plants, and unique habitats. Substantial overlap and similarity exists between many of these systems.

This, then, is the context in which *WFIS* is being designed, developed, and implemented. Only a few of the above events are substantially tied to the Wildlife and Fisheries Program. Thus the driving force for the development of information systems is the Bureauwide initiative to both automate and modernize our information systems, while doing a more comprehensive job of administering the Bureau's data. Moreover, the Bureau's current approach to information engineering is important for the development of all data. The challenge to the Wildlife and Fisheries Program is to ensure that information needs are being met while working cooperatively in the Bureauwide effort and providing leadership in the arena of resource information systems. The challenge increases significantly if we are to concurrently meet our on-the-ground responsibilities with our existing program staff.

The efforts and errors of the past have provided some lessons about developing ADP systems. These lessons provide the basis for the assumptions listed in the next section.

Assumptions

The following consists of a set of working assumptions that form the basis for the proposed Wildlife and Fisheries Information System and its implementation strategy. They are based, in large part, on experience gained from past efforts in automation. Some of these assumptions probably are commonly accepted in the Bureau; others probably are not. Some are applicable to other programs in the Bureau; others are probably unique to the Wildlife and Fisheries Program.

- Defining and identifying data elements are the two most difficult tasks in designing an information system. The more difficult task is to identify what data needs to be stored and how it is to be used. Numerous efforts in the past have concentrated on identifying (system) software and hardware needs. This typically turns out to be the easiest task. Hardware and software can and will change, but the basic data elements and operations, once properly identified, should be reasonably stable. With this in mind, the assumption is that current efforts aimed at standardizing the Bureau's "corporate data" will be completed and implemented. For a more extensive discussion of this process see the *Data Set Standardization Handbook.*

- Information is used for (at least) four different purposes as described below.

  - Direct Use - This is data that is used by the individual or organization that puts the information into the system; the individual or office that provides the information usually can and should be able to alter or modify the data periodically.

  - Data Sharing (internal and external) - This is data that may be used by individuals or offices; such offices may use or copy the information, but they cannot alter the data in any way.

  - Archiving - This is data that needs to be preserved for later use by the same or different individuals or offices; archived data should not be modified by anyone.

  - Summary to Higher Level - This is data that is aggregated from several sources and summarized at another level of the organization, e.g., statistics from District Offices (DOs) that are summarized into statewide and Bureauwide reports.

All of the Bureau's Wildlife and Fisheries Program data will be in one or more of the above categories. The categories will determine the structure of the appropriate data base(s) and/or subsystem and the configuration of software, software engineering, and hardware. For example, data that must be summarized to a higher level needs to be in some form of a network where offices doing the summary have access to the lower levels. This is only one of the reasons for acquiring a truly relational data base and developing a standardized information system Bureauwide.

- No single system can be designed that will meet all the needs of all users. The problems biologists encounter are so different that one cannot expect that a system designed for a biologist in Wyoming, for example, will be useful to a biologist in Alaska. On the other hand, data that is to be shared, archived, or summarized to a higher level needs to be in a standardized format and adequately documented so that miscommunication is avoided.

  The solution to these conflicting needs is to design systems that allow users to modify their copy of the data for their use, while providing common standards for the shared portion of the system.

- Adequate documentation and common data element definitions are necessary for all systems at all levels.

- The *WFIS* must be developed with field or "end user" input at all stages. To remain effective, systems must be modified as conditions and user needs change. Prototype systems must be designed, programmed, tested, and then used and modified over time, utilizing Life Cycle Management (LCM).

- Wildlife biologists are better at defining data elements, data flow, and processes/procedures than they are at developing systems. This is because, in many cases, systems for using data are not available or are very poorly developed. As a result, the resource data bases and systems will be much more difficult to develop than the administrative ones. However, user-friendly (fourth generation Structured Query Language [SQL]) software should make it easier for biologists to direct the automation of resource functions.

- Developing a good, usable integrated system will require a substantial commitment of effort and funds. Shortcut approaches to the job may provide short-term solutions, but they will be more costly and time-consuming in the long run. The *WFIS* subsystem development/implementation to date is a good example in that it demonstrates that by not sufficiently funding the entire process, the finished products are either obsolete in terms of hardware and software or are not accepted and used by the end users. Additionally, the operation and maintenance costs begin to exceed the benefits. Existing *WFIS* subsystems were designed prior to current LCM requirements. They were, however, approved as Bureauwide ADP systems and were designed, developed, implemented, and tracked as research development project(s) through the Research and Development Tracking System. User guides were developed to document and promote use of these subsystems in preparation of the Target System. All new development of proposed *WFIS* subsystems will go through LCM.

- Wildlife Program personnel and others involved in the Wildlife and Fisheries Program will continue to possess widely varying levels of skill, enthusiasm, and expertise in the many facets of automation. This fact, combined with the lack of a comprehensive, widely supported, operational system means that implementation of this plan will continue to require persistence, flexibility, and extra effort by the growing numbers of computer users and enlightened managers.

- The SIP ► Interim ► Test ► Pilot ► Target System process will continue as currently planned in the Master Plan and will be implemented in 1995-96. The ORACLE software selected for the interim period may be available on the PRIMEs and to PC users accessing PRIMEs during the interim period for those approved systems whose requirements currently cannot be met by standalone PCs.

- All existing *WFIS* subsystems that are operational on the SC's Honeywell platform will be converted to the target platform beginning in FY 93 as part of the Target System implementation and will undergo LCM requirements prior to conversion.

- All new *WFIS* subsystems that are operational on State Office (SO) PRIME minicomputers will be converted to the target platform beginning in FY 95-96.

- All *WFIS* subsystem development between FY 90-95 will go through the LCM process to identify user requirements and hardware and software configuration.

- In support of ALMRS and second generation land use planning, the *Inventory* subsystem of *WFIS* should be the first subsystem to be converted to the interim software in FY 92-93.

These steps will require substantial data entry and cleanup by program personnel during the next 2 years. This effort will also require significant support from IRM personnel at all organizational levels.

Where Do We Want To Be and By When?

Objectives

The overall objective of this plan is to provide for continued development and implementation of the ***WFIS*** subsystems, as outlined in Table 1, to meet the current needs of program personnel and managers at all levels, while establishing increased standardization and organized transition through the interim period and into Target System implementation.

The initial measure of the objective is to have the ***WFIS*** fully operational by the end of FY 92. Operational is defined as all offices having at least three subsystems "up and running." In support of the riparian management initiative, one of those subsystems will be ***Inventory***, specifically the ***RAIDS*** data base. The second will be the ***Special Status Species Tracking*** subsystem, and the third, a ***WFIS*** subsystem which meets one of the current needs in a specific office. In addition, all of the existing program management subsystems will be "up and running" at least at the SO level, including ***Habitat Management Plans, Program Statistics, Personnel, Planned Actions, and Plan Tracking.*** These program management subsystems will support the Fish and Wildlife Program initiative for reporting productivity measures for tracking Fish and Wildlife 2000 implementation.

An additional, but perhaps equally important, objective is to reduce duplication caused by multiple agencies such as the Bureau, state wildlife agencies, and private organizations developing and maintaining similar data systems. This would allow for greater data exchange and possibly even more data being gathered/recorded so that the various systems would complement rather than compete with one another.

The System

The Wildlife and Fisheries Information System described here consists of 12 separate program-specific subsystems that provide for storing, processing, retrieving, and communicating data and information at all levels of the Bureau (Table 1). It includes six subsystems that are already in existence and six that are currently under development or need to be developed. There are also eight common or shared subsystems that should be part of the Target System (Table 2).

The evolution of the ***WFIS*** needs to move from its current 12 separate subsystem structure to common data elements between subsystems with data passing from subsystem to subsystem without direct user entry. From there the ***WFIS*** needs to move toward a totally relational data base, and then on to become part of the Bureau's automated resource data base, in support of the Target System.

WFIS includes subsystems for both resource management and program management. The former includes two systems that are primarily graphical; however, these map systems are intended to be used in conjunction with the LIS function of the Target System. Development of these applications will be deferred. A brief description of each system follows.

Table 1. Current Status and Development Priority of Existing and Interim *WFIS* Subsystems.

12 *WFIS* Subsystems	Platform/ Software	Status	State Office Involvement [3]	Priority/FY
Inventory[1]	MF ASPEN/2 PC	Existing[7]	N/A SC	4/92
Program Statistics[2]	MF ASPEN/2 PC	Existing[7]	N/A SC	5/92
Habitat Management Plans[2]	MF ASPEN/2 PC	Existing[7]	N/A SC	6/92
Personnel[2]	MF ASPEN/2 PC	Existing[7]	N/A SC	7/92
Habitat Development[1,4]	MF PC ASPEN/2 FOCUS	Existing [7]	N/A SC	8/93
Investment Analysis Model[2,5]	PC DOS FOCUS	Existing[7]	N/A SC	9/93
Special Status[1,2] *Species Tracking*	TBD[6]	Under Development	SC	1/91
Planned Actions[2]	TBD	Under Development	AZ, UT	2/91
Plan Tracking[2]	TBD	TBD	AK, CO	3/92
Monitoring[1,2]	TBD	TBD	AK, WY, NV	10/93
Habitat Modeling[1]	TBD	TBD	NV, NM, OR	5/94
Population Modeling[1]	TBD	TBD	SC	6/94

[1] Resource management.
[2] Program management.
[3] Principal SOs involved in providing assistance in the identification of user requirements and testing (includes field office involvement).
[4] Rangeland Management Projects System (RIPS)/JDR.
[5] Old SAGE RAM.
[6] To be developed.
[7] Redesign of existing systems.

Table 2. Common/Shared Interim and Target Subsystems Needed by *WFIS*.

8 Target Subsystems	Platform/ Software	Status	Status Office Involvement	Priority /FY
Annual Work Plan[3]	PC MF	TBD[1]	Bureauwide (FFS)	1/91
Bulletin Board[3]	PC CompuServe	Existing[4]	Bureauwide	2/91
Historical Notes[3]	PC dBASE	Under Development	MT, UT, ID	3/92
Public Contacts[3]	PC MF	TBD	NM, Bureauwide	4/92
Publications[3]	PC	Existing[4]	SC	5/92
Training[3]	PC MF	TBD	PTC, ID Bureauwide	6/93
Photo/Video Files[2]	PC	TBD	Bureauwide	7/93
Working/Master Map Files[2]	PRIME ORACLE	Pilot	WY, OR, NM	8/93

[1] To be developed.
[2] Resource management.
[3] Program management.
[4] Redesign of existing systems.

WFIS Existing and Interim Subsystems

Inventory - This existing subsystem stores and retrieves wildlife, fisheries, and special status plant habitat and population data.

Program Statistics - This is an existing subsystem for statistical data on the Wildlife and Fisheries Program which is used for Public Land Statistics (PLS) and other reports.

Habitat Management Plans - This is an existing subsystem that stores basic statistics on both existing and planned Habitat Management Plans (HMPs) such as target species, dollars spent, money contributed, and funding required for complete implementation.

Personnel - This is an existing subsystem used to track and store program related data about Wildlife and Fisheries Program personnel.

Habitat Development - This subsystem will use (link) information within the Rangeland Information System (RIS), and Rangeland Improvement Projects System (RIPS), and will record habitat improvement and development projects as well as all other program specific on-the-ground developments.

Investment Analysis Model - This subsystem will use (link) the RIS recently released, PC-based Investment Analysis Model to analyze and document economic consequences of habitat and rangeland improvements and developments.

Special Status Species Tracking - This subsystem is currently under development and will consist of a summary of current information on legal and biological status of threatened, endangered, or candidate species.

Planned Actions - This subsystem is currently under development and will be used to track planned actions and accomplishments at the activity plan level. It would include planned projects as well as studies, introductions, cooperative positions, research, Memoranda of Understanding (MOUs), access acquisitions, etc., that are part of the Wildlife and Fisheries Program. This subsystem will also be used to track the Challenge Cost Share initiative.

Plan Tracking - This subsystem will be designed to track wildlife and fisheries objectives and commitments in all types of planning documents including Fish and Wildlife 2000, Resource Management Plans (RMPs), recovery plans, HMPs, strategic plans, etc.

Monitoring - This subsystem will provide a data base(s) for storing, retrieving, and archiving monitoring data. It will also consist of two other components, one containing raw data and producing standard analyses and reports, the other containing summaries and scheduling information that would be more of an administrative data base.

Habitat Modeling - This subsystem will provide necessary software and data for developing, using, and documenting habitat models.

Population Modeling - This subsystem will be a two-part subsystem containing population/demographic data in one part and predictive population model(s) in the other. It will be used to assist program personnel and managers in predicting the environmental and population factors necessary for maintaining a viable population. The subsystem will rely on habitat data within the ***Inventory*** and ***Monitoring*** as well as the ***Habitat Modeling*** subsystems.

Interim and Target Common/Shared Subsystems

Annual Work Plan - This subsystem will automate the packaging/programming/ budget process.

Bulletin Board - This is an existing subsystem that allows electronic messages to be sent and received by any biologist in the Bureau with access to the SC mainframe computer. Some program personnel are also using Compuserve, accessing this system with their PCs and communication software.

Historical Notes - This will be a subsystem for storing and retrieving narrative or other information that does not conform to the format of other subsystems.

Public Contacts - This subsystem will be a directory of non-Bureau people and organizations/agencies that program personnel or managers at any level need to contact to provide or receive information.

Publications - This will be a subsystem for tracking publications by program personnel resulting from program projects/research/studies and will integrate with BLM Monthly Alert/Library computerized data base.

Training - This will be a subsystem for displaying, scheduling, and tracking all Bureau training. A combination of several existing systems, including PAY/PERS, should be able to meet our minimum requirements for such a subsystem.

Photo/Video Files - This will be a subsystem for storing, retrieving, and displaying pictures stored on video discs.

Working/Master Map Files - This subsystem consists of working and master map files in the GIS that are used to store and manipulate spatial information about fish, wildlife, and rare plant habitat and populations.

These 20 subsystems are described in more detail in Appendix 2. Twelve of the 20 subsystems represent the major functions of the Wildlife and Fisheries Program that are feasible to automate at this time. Many of these subsystems represent general BLM needs, such as the annual work plan subsystem, and should be developed to meet all of the requirements from the various other Bureau programs.

Applications

Tables 3 and 4 illustrate some applications of the various ***WFIS*** subsystems in both resource management and program management settings. This portrayal of the applications is similar to the results obtained with the Enterprise Data Model (EDM) completed in mid-FY 90, which portrays data classes against program processes or functionalities. It is helpful in understanding why the systems must be standardized both horizontally and vertically to ensure that the data being used at any location is derived directly from the original data and has the same meaning in all offices.

Table 3. Resource Management Applications Utilizing *WFIS*.

WFIS Subsystems	Mid-Level or EDM Functions/Process	Major Outputs
• *Master Map Files* • *Historical Notes* • *Inventory* • *Publications*	Inventory	• Historical distribution • Identification of potential & existing suitable habitat • Conflicts
• *Habitat Modeling* • *Population Modeling* • *Plan Tracking*	Land Use Planning	• Multiple use analysis • Reintroduction & management areas identified • Objectives identified
• *Inventory* • *Monitoring* • *Working Map Files* • *Bulletin Board* • *Habitat Modeling* • *Population Modeling* • *Planned Actions* • *Investment Analysis*	Plan/Project Development	• Specific objectives developed • EA • Project tracking • Annual HMP Report • B/C ratio, determination of best mix of projects
• *Annual Work Plan* • *Public Contacts* • *Investment Analysis* • *Plan Tracking*	Budget Development and Management	• Approved/completed project • Interest groups & volunteers • Contributed $, labor, materials
• *Program Statistics* • *Publications* • *Monitoring* • *Plan Tracking*	Monitoring & Inspection	• Plan evaluations • Annual reports • Proposed management & adjustments • Field schedules

Table 4. Program Management Applications Utilizing *WFIS*.

***WFIS* Subsystems**	**Mid-Level or EDM Function/Process**	**Major Outputs**
• ***Program Statistics*** • ***Personnel*** • ***HMP*** • ***Plan Tracking*** • ***Planned Actions***	Human Resource Management Budget Development and Management	• Staffing trends • HMP trends • RMP/HMP needs & accomplishments • FW2000 needs & accomplishment
• ***Personnel*** • ***AWP*** • ***Bulletin Board***	Budget Development and Management Monitoring	• AWP tracking • FMS/manpower correlation reports • WO/SO and • SO/WO Messages
• ***Public Contacts*** • ***Investment Analysis*** • ***Inventory*** • ***Bulletin Board*** • ***Special Status Species Tracking*** • ***Program Statistics*** • ***Monitoring*** • ***Planned Actions***	Outreach Coordination Directives	• Public contact lists/mailings • Contributed $ by office, by species group • B/C estimates • Public inquiries • Congressional inquiries • FW2000 needs & accomplishments
• ***Statistics*** • ***Personnel*** • ***HMP***	Plan/Project Development & Revision	• PLS, RPA • Publications • Acres improved or monitored • Population trends • Projects

How Are We Going To Get There?

Implementation Strategy

The objective of this plan is to have ***WFIS*** fully operational by the end of FY 92, with fully operational being defined by the Wildlife ADP Users Group as:

- All offices will have at least three subsystems operational on their resident hardware and software. In support of the riparian management initiative, one of those subsystems will be ***Inventory***, specifically the ***RAIDS*** data base, and the second must be ***Special Status Species Tracking***. The third subsystem would be an existing ***WFIS*** subsystem of the user's choice.

- All Wildlife and Fisheries Program staff will be computer literate. Computer literate is defined by the skills, knowledge, and abilities that WO Instruction Memorandum 90-261 identified for inclusion into personnel documents for program leads and users.

- Each state will, by the end of FY 91, have a plan of action/operation prepared which provides for the entry and administration of **all** program data by the end of FY 93, following WO development of standards and guidelines. All of the data will be in standard data elements as they are incorporated into the new Data Element Dictionary (DED).

The following strategy identifies priorities, responsibilities, schedules, and general tactics for completing the development of the Wildlife and Fisheries Information System to lead into the Automated Resource Data component of the Bureau's Target System. The strategy recognizes that many actions and decisions are being taken Bureauwide in the development of the Target System and in the process of ADP modernization. These actions and decisions are, for the most part, beyond the scope of program managers and specialists. This does **not** imply that program personnel will focus their efforts **only** on ***WFIS*** implementation; they very likely will also be involved with other aspects of the Target System development. It is **only** by working on both efforts that the overall objective will be met. Thus, the strategy outlined must be flexible enough to adapt to Bureauwide decisions and actions and be integrated with the Master Plan.

Priorities

The system will be developed in increments, identifying user requirements, designing, constructing, and if necessary, redesigning the 12 ***WFIS*** subsystems previously identified. The priorities for development are listed in Table 1. The WO Division of Wildlife and Fisheries, with input from the SC Division of Resource Services, the Wildlife ADP Users Group, WO IRM and LIS staffs, will annually adjust system design, development, and implementation priorities if necessary. As the AIM process develops, the ***WFIS*** plan and schedule will require corresponding changes to ensure that ***WFIS*** is integrated and complements the Bureau's Master Plan. The priorities must also reflect the need to span fiscal years in order to complete the LCM process.

Responsibilities

- The Chief of the Division of Wildlife and Fisheries (WO-240) or his/her representative will be the Project Sponsor for the Wildlife and Fisheries Information System. The Project Sponsor will be responsible for overseeing the project proposal through the LCM initiation phase, preparing a charter, and when it is appropriate, providing funding and program support and overseeing general project development and implementation. As the System Owner, the Chief will also have final authority on decisions regarding development, operation, and maintenance of the ***WFIS***.

- The SC Division of Resources Services (SC-210), will have overall responsibility for identifying user requirements within the LCM process. Until a Project Manager is designated by the Program Project Board or IRM Review Council (IRMRC), the Division will serve as interim Project Manager evaluating and recommending changes to the systems operation and maintenance functions, as well as providing a full-time user representative. Coordination between SC divisions and WO IRM staff will occur to ensure compliance with the Enterprise Data Model, Target System development, and implementation of the Master Plan.

- The SC Division of Project Management (SC-320) will assume day to day on-site project assistance and support once a Project Manager has been designated.

- The SC Division of Systems Operation and Maintenance (SC-340) will be responsible for the actual development, operation, and maintenance of each new subsystem.

- The Wildlife ADP Users Group, with SC Division of Resource Services serving as a coordinator, will continue to serve as an advisory group to ensure that systems being developed receive field input and review. Special ad-hoc user requirement teams will be used to help oversee development and revision of each subsystem identified in Table 1. States listed in Table 1 have been tentatively identified because of the emphasis in their states in relation to the subject data subsystem.

- The WO Division of Wildlife and Fisheries will provide final review and approval of all LCM documents, after a review by other appropriate divisions and staffs. Newly revised LCM processes will be followed to ensure standardization and compatibility. Responsibility for conversion of such systems to interim and/or Target Systems will be done by the Division of Modernization at the SC or other groups as determined by Annual Work Plan (AWP) and management decisions.

Schedule

A tentative schedule for completing the ***WFIS*** was generated by the Wildlife ADP Users Group at their 1989 meeting and is shown in Table 5. Scheduling of those subsystems identified as "common/shared" will, however, depend highly on Bureauwide decisions regarding the Target System.

Strategies

1. **Continued Development** - Subsystems currently in the process of identifying user requirements, the initial stages of LCM, are ***Planned Actions*** and ***Special Status Species Tracking.*** The hardware/software configuration will be determined through the LCM process. Future subsystems will use the software identified for either the interim platform or target platform according to Bureau guidance. The usability of the subsystem and access to the data are the primary considerations regardless of the communication, hardware, and software configuration.

   In addition, LCM documents for each subsystem will receive field review by program specialists and managers. New ***WFIS*** subsystems will receive additional field testing beyond the LCM process, which now only provides for limited testing by the user requirement team.

   Existing ***WFIS*** subsystems, including completed enhancements, will be converted to the interim platform as part of the Technical Redesign Software Improvement Process (SIP). Strong consideration will be given to the use of a truly Relational Data Base Management System (RDBMS) for the remaining subsystems if transportability between field offices and higher level offices can be arranged. This approach should reduce the scope of redesign to the Target System.

2. **Equipment** - In general, everyone working in the wildlife, fisheries, and special status species programs should have immediate access to a PC near his or her work area. Each PC should, as a minimum, be configured as outlined by current Bureau policy and loaded with software as outlined below, in accordance with each state's IRM Plan and consistent with BLM software standards:

   - An IBM-compatible PC, either a 286 or 386 with a minimum of a 40 megabyte hard drive, with DOS 3.3 or greater, 1 megabyte of RAM, and a 5 1/4-inch 1.2 megabyte floppy drive.

   - A modem and communication software (SOFTERM) which allows for uploading and downloading of text, both ASCII and binary files, as well as for using bulletin boards and Electronic Mail Systems (EMSs).

   - ASPEN/2 with the Relational Link Option to allow use of existing WFIS subsystems and subsystems currently under development, and data integration from nonstandardized data bases or files.

   - Word processing capability in the form of the Bureau's standard of WordPerfect 5.1.

   - Software that allows conversion between word processing softwares is almost a necessity as long as nonstandard software remains in use in many offices.

   Hardware and software specifications beyond those listed above will be identified through the LCM process for each of the ***WFIS*** subsystems.

   During FY 91 and FY 92, State and District Offices should earmark funds for procurement to equip program and support personnel with hardware and software to meet the requirements outlined above. This funding will be based on the SOs' assessment of needs and coordinated with State ADP/IRM Plans and the LIS Master Plan. Bureauwide, an estimated $500,000 to $750,000 will be required to support program personnel.

   State Office, IRM, and Wildlife Program staffs need to meet and agree to address statewide ***WFIS*** equipment, software, communication, and configuration requirements to support ***WFIS*** implementation. This information should then be incorporated into each state's 5-year IRM Plan and subsequent budget documents.

   Since DO, SO, SC, and the WO are not yet standardized in terms of hardware and software configuration, no attempt is made here to address that aspect except to make the following assumptions:

   - Configuration decisions for the interim period will quickly resolve any lingering problems for communication and standardization in terms of hardware, software, and data elements.

   - All offices will be able to communicate electronically with other offices as well as the SC mainframe and have access to Compuserve or an equivalent EMS during the interim period.

   - The WO and SC will consider/evaluate the option of using large-capacity PCs resident at one or more locations to facilitate the use of a RDBMS for some of the subsystems during the interim to provide for archiving, communication, and aggregation of information that is now done on the mainframe.

   Because the decision has been made to use ORACLE as the interim software on PRIMEs, techniques will be explored with interim and Target staffs to provide portability of data between the different organizational levels of the Bureau as shown in Table 6. In the past, the use of the SC computer as the primary or required location of data has necessitated the use of ASPEN/2. The data standardization process currently underway will also help resolve this problem of data portability.

3. **System Administration and Management -** Table 6 outlines the primary location of the data and the responsibility for its entry, management, and administration during the interim period. The administration and management of data should not change much in the Target System. Original data refers to the location of the collection and entry of original data and the location where the data would reside and be used in its original and most detailed form. Corporate data, data summarized from lower organizational levels and used by higher organizational levels, are data with less detail, but often cover a wider area and are derived directly from the original data.

   An example of Resource Management original data would be the number of elk per habitat unit and habitat type, while the DO, SO, and possibly the WO may need corporate data, i.e., the total number of elk within the Resource Area/District/State. An example of Program Management original data would be AWP data at the Resource Area (RA), DO, SO, SC, PTC, and WO levels, while the DO, SO, and WO would also have corporate data from each of the offices at a lower level. Every data base will be documented by the states data administrator and have an assigned data base manager. This documentation must be kept current and follow the Bureau's Data Administration Plan.

   During the interim period and particularly for the Target System, all efforts should be made to avoid entering data more than once or storing duplicate data. This means that when another office or organization has the needed data, arrangements should be made for periodic transfer or updates, and even for on-line access, where costs and system administration savings can be realized.

   Each office that generates original data is ultimately responsible for data base administration and management, its content, cleanup, consistency with the DED, backup and archiving, as well as data entry. The originating office will be responsible for original data quality and will have read and write permissions. Other offices using original data will have read only permission. Standards for acceptable clean data will be established as outlined in the implementation schedule.

   SO and DO program leaders will be responsible for providing input into the ***WFIS***, training others (or seeing that training is made available for RA and DO program personnel) in the use of ***WFIS***, and providing a minimum level of user support to the field offices.

   WFIS technical support and responsibilities by DO and SO IRM staffs will be to assist with the procurement, installation, and maintenance of the hardware and software identified. IRM staff specialists will also need to become generally familiar with the basics of the ***WFIS***.

4. **Support Needs -** As the use of automation expands, there will be a growing need for technical support for both PC users and mainframe users. Technical support is needed at all organizational levels. This means that program personnel and IRM staffs at the RA, DO, SO, and WO must become familiar with ***WFIS*** and what is needed to support its implementation. The results of the recently completed IRM Organization Study are intended to resolve part of the problem, but program leaders and field staff input is still needed in identifying the workloads associated with ***WFIS*** implementation. Tentative support needs have been identified for the Wildlife and Fisheries Program within staffing needs analysis. Within this document, specific numbers of program support personnel and the skills needed (i.e., computer assistants and data entry clerks) were identified.

5. **Relationship to LIS, Other Systems, Enterprise Data Model, and Data Standardization -** Proceeding with the ***WFIS*** implementation will provide for an orderly transition from the current hardware and software through the interim period and into the Target System. Because the Wildlife and Fisheries Program is the only renewable resource with a strategic plan for the development and implementation of a com-

prehensive information system (Figure 1), it is especially important that it be brought forward into the Target System. Technical assistance will be requested from the SC Divisions of Data Management and Systems Engineering staffs to outline that process with the objective of achieving the distribution of data bases and data outlined above. This will probably mean conversion of some of the systems to interim hardware and/or software, depending on upcoming decisions regarding LIS procurement and interim configuration. The need for funding and personnel for these substantial tasks will require that the ***WFIS*** demonstrate a pattern of use sufficient to justify the costs.

The ongoing data standardization process will have major implications for ***WFIS*** both in workloads and benefits. It will accomplish a level of standardization which, if other agencies and organizations meet us halfway, will enhance data sharing and reduce duplication. The revised DED, once it is integrated into the interim and Target System, will be an on-line, active DED that will mean cleaner, more consistent data for the program. During the interim, since the ***WFIS*** will be primarily PC-based, procedures and guidelines will need to be developed so that all corporate data entry will be run against the new DED. All data entered, including field data, must match the corporate data elements. BLM will continue to work with other entities to further the cause of fish and wildlife data standardization. One area of duplication that will necessarily persist is in location data. BLM will rely primarily on digitized spatial data whereas many other organizations will not have this technology readily available. To meet this need, the Bureau's fish and wildlife data will need to include other location information in addition to spatial linkages that will be determined by the standardization process.

Table 5. *WFIS* Implementation Schedule.

FY 90

- Complete user guides for ***IHICS, RAIDS, TEDS, WORDS, Program Statistics, HMPS, Personnel.*** **(SC)**
- Review and revise *WFIS* implementation schedule, if necessary. **(WO, SC, Wildlife ADP Users Group)**
- Assess hardware and software needs. **(All Offices)**
- Identify support and training needs. **(All Offices)**
- Solicit feedback from SC, PTC, and SOs on FY 91 *WFIS* funding needs. **(WO)**
- Incorporate *WFIS* directives and funding into FY 91 **PAWP** and FY 92 **PYBP. (WO)**
- Initiate Test Site Proposals and Agreements with New Mexico SO and other agency data. **(SC, NMSO, MSFWIS/TNC)**
- Initiate on-site training using new PTC position and continue classroom training when requested. **(SC, PTC)**

FY 91

- Revise *WFIS* Plan; request review from all offices; obtain signatures and distribute. ***(WO)***
- Define user requirements for ***Planned Actions and Special Status Species Tracking. (SC)***
- Finalize 5-yr IRM Plan adjustments as directed in AWP. **(All Offices)**
- Train all SO program leaders and IRM staff, utilizing two sessions with hands-on practice; also include SC and WO IRM staffs. **(PTC)**
- Continue training for all Wildlife Program personnel and IRM staffs at the DO and RA level. **(PTC)**
- Complete design, including user guides for ***Planned Actions and Special Status Species Tracking.*** **(SC)**
- Continue hardware and software acquisition and data entry within at least three *WFIS* subsystems. **(All Offices)**
- Review and revise implementation schedule, if necessary. **(WO, SC, Wildlife ADP Users Group)**
- Provide guidance to complete data entry and cleanup using revised Data Element Dictionary. **(SC)**
- Begin data entry and cleanup. **(All Offices)**
- Continue to develop and prototype remaining *WFIS* subsystems. **(SC)**

Table 5. ***WFIS*** Implementation Schedule (Cont'd).

- Continue test site implementation, integrating other agency and organization data. **(SC, NMSO, MSFWIS/TNC)**
- Refine user requirements for existing ***WFIS*** subsystems. **(SC)**
- Define user requirements for the remaining ***WFIS*** subsystems. **(SC)**
- Request end-of-year progress reports for FY 91. **(SC)**
- Identify FY 92 workmonths, staffing, and funding needs. **(WO)**
- Direct, within FY 92 PAWP, all offices to be fully operational by end of FY 92. **(WO)**

FY 92

- Complete data cleanup, transfer, and entry into ***WFIS*** subsystems in preparation for conversion to the Target System. **(All Offices)**
- Evaluate test site results. **(WO, SC, NMSO, MSFWIS/TNC)**
- Review and revise implementation schedule, if necessary. **(WO, SC, PTC, Wildlife ADP Users Group)**
- Analyze other data bases in use within each state and make recommendations. **(SO, SC, Wildlife ADP Users Group)**
- Complete full operational status of at least three subsystems in all offices including RAs.
- Request FY 92 end-of-year progress reports from SOs. **(WO)**
- Reevaluate and modify anticipated workmonths, staffing, and funding needs for FY 93. **(WO)**
- Update ***WFIS*** plan to reflect status of interim and Target LIS System, including procurement, configuration, administration, and other implementing actions. **(WO, SC)**
- Finalize ***WFIS*** subsystem training. **(PTC)**

FY 93 - FY 95

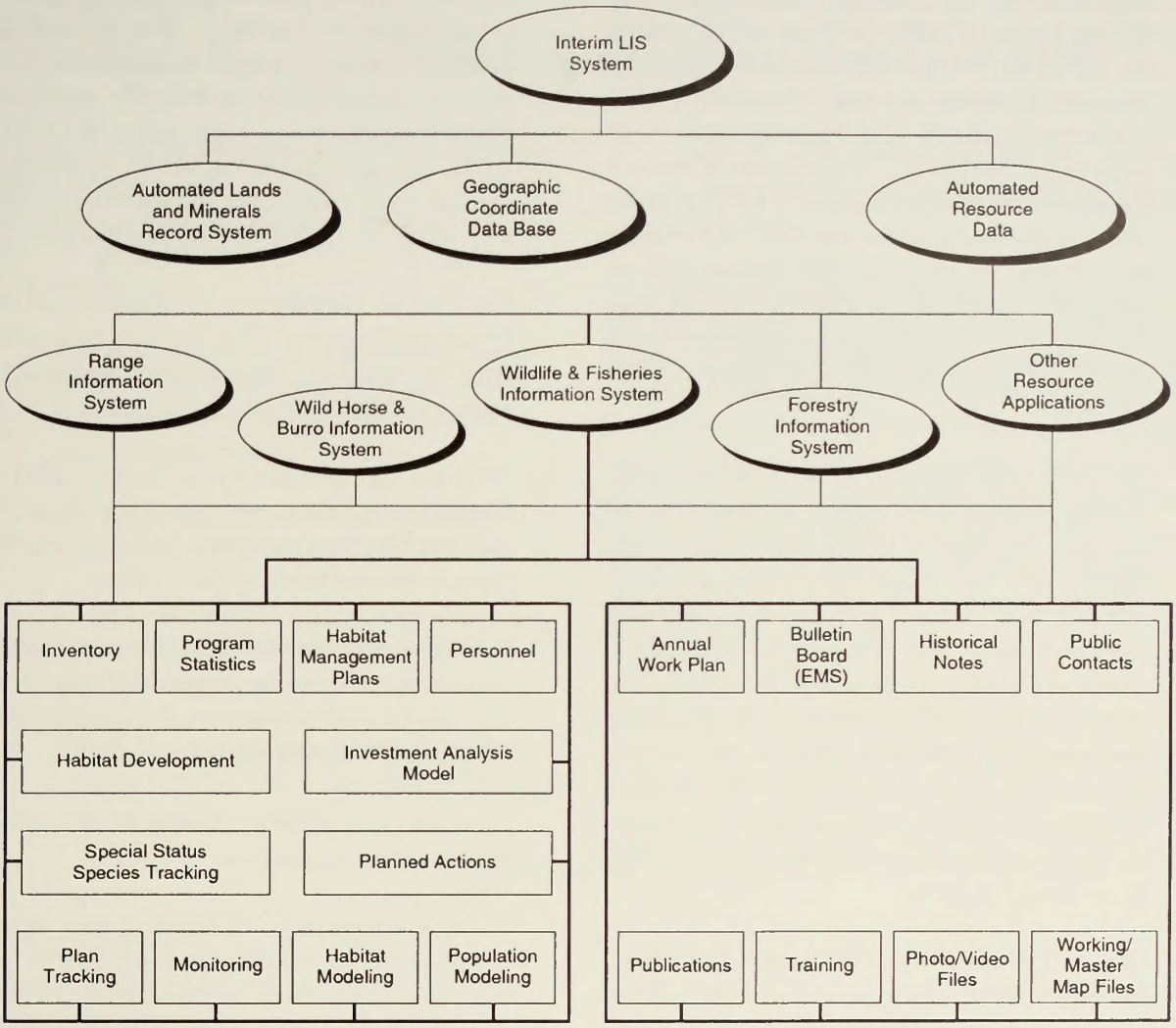
- Begin ***WFIS*** subsystem conversion to Target LIS platform, both alphanumeric data and spatial ***WFIS***data. **(Contractor ?)**
- Initiate interagency MOUs for data sharing and system administration based on test results. **(WO)**
- Revise ***WFIS*** user guides, if necessary, to reflect implemented LIS and full integration. **(WO, SC, PTC)**

Table 6. *WFIS* and Common/Shared Data Location and Administration.

WFIS SUBSYSTEMS	ORIGINAL DATA SOURCE	CORPORATE SOURCE
Inventory	RA, DO	DO, SO, SC
Program Statistics	RA, DO	SO, SC[1], WO
Habitat Management Plans	RA, DO	SO, SC[1], WO
Personnel	SO	SC[1], PTC, WO
Habitat Development[2]	RA, DO	DO, SO, SC, WO
Investment Analysis	RA, DO	N/A
Special Status Species Tracking	RA, DO	SO, SC[1], WO
Planned Actions	RA, DO	DO, SO, SC[1], WO
Plan Tracking	ALL	DO, SO, SC[1], WO
Monitoring	RA, DO	DO, SO, SC, WO
Habitat Modeling	ALL	N/A
Population Modeling	ALL	N/A
COMMON/SHARED SUBSYSTEMS		
Annual Work Plan	ALL	DO, SO, WO[1]
Bulletin Board/EMS	ALL	N/A
Historical Notes	ALL	DO, SO, WO
Public Contacts	ALL	SO, SC, WO
Publications	ALL	SC, PTC
Training	SO	PTC, WO
Photo/Video Files	ALL	SC
Working/Master Map Files	RA, DO	SO, SC

1 SC may serve as the corporate data location during the interim for WO.
2 Rangeland Improvement Projects System (RIPS), and old JDR System.

Figure 1. ***WFIS*** and Common/Shared Subsystems and Their Relationships With Other Resource Programs.



6. **Training Needs/Delivery** - In order to achieve full implementation of the system, training must be provided that allows **all** field offices to use those subsystems that are applicable for their current workloads and to input all of the existing data in an automated format. An approach similar to that used by the Range Program in implementing the Grazing Authorization and Billing System (GABS) program will be applied for ***WFIS*** and will provide on-site training with the users' hardware and data. This effort will be conducted by the Phoenix Training Center with assistance from the SC. The traditional form of classroom or workshop training in ***WFIS*** systems will also be available from the PTC. A schedule and detailed proposal for this training will be developed as part of the strategic training plan for fish and wildlife. It will then be incorporated into the AWP process with input from PTC, SC, and SOs.

   The PTC will continue to provide the initial training through development and implementation of a package or module using an on-site trainer, who will travel from office to office, utilizing each office's machine, data, and data entry personnel. After training has been delivered statewide for a particular ***WFIS*** subsystem, the SO will assume the major role in providing user support. This shift from the SC role in training will allow their efforts to be directed towards subsystem development, operation, maintenance, and support during the transition to the Target System.

7. **System Development, Operation, and Maintenance** - The SC will continue to lead the process of subsystem development including identification of user requirements, software development and testing, user guide development, and support. Each subsystem development will be guided by a team to include two field office end users, two members of the Wildlife ADP User Group, and others with specific expertise in the subject area. Each subsystem will have a complete description of user requirements and design criteria which will be reviewed by the interim and Target System staffs, and approved by the WO program and IRM staffs, prior to proceeding with the programming and testing. The SC will also continue to provide a user representative for the entire system, although as field offices progress, this need can be increasingly met by SO and DO staffs. It is anticipated that the SC responsibilities for system operation and maintenance will also significantly increase during this period.

   SO roles, as identified by the Bureauwide IRM Organization Study, are to provide data administration, data base administration, training, and technical ADP support for field users.

   DO roles, as identified by the Bureauwide IRM Organization Study, are to provide limited training, data base administration, and technical ADP support for end users in their offices.

   RA roles, as identified by the Bureauwide IRM Organization Study, are to provide limited training, data base administration, and technical ADP support for end users in their offices.

   Data entry should be handled by the office originating and using the data.

8. **Use of Contracting** - Contracting may be used to achieve timely training when necessary. Contracting or cooperative agreements may also be utilized to develop subsystems and user guides or to meet special needs as implementation progresses. Contracting could be done at the WO, SC, or SO levels.

Implementation Schedule

The WO will oversee the overall system development and implementation of this plan through the AWP process, with input from the Wildlife ADP Users Group, SC, PTC, and SOs. Evaluation and followup will also be accomplished by both the WO and SOs to ensure implementation is taking place so the entire Bureau is ready to move all of the Wildlife and Fisheries Program data/systems into the Target System during FY 95-96.

Data Exchange With Organizations Outside of BLM

As part of the implementation process, each state Wildlife Program leader should identify systems being used by the various agencies and organizations within their state, which may include one or more of the following:

- Procedures data bases, set up under the umbrella of the Multi-State Fish and Wildlife Information System (MSFWIS) project by state fish and wildlife agencies.
- Heritage data bases, set up on a state basis by The Nature Conservancy (TNC).
- Endangered Species Information System, operated by the U.S. Fish and Wildlife Service (FWS).
- Other data bases operated by U.S. Forest Service (USFS), Soil Conservation Service (SCS), U.S. Geological Survey, (USGS) conservation organizations, universities, or others.

During FY 91 and FY 92, the SC should analyze data bases that the Bureau could use cooperatively or access. The analysis should include methods of data access and exchange. Other factors to be considered are whether the Bureau will maintain any stored data bases or rely on updated versions from external agencies or groups. The usual accompanying determinations must be made in terms of software, data residency, etc, and would be included in each state's IRM plan. Any widespread or common needs should be supported Bureauwide.

Approval Process

All of the decisions regarding ***WFIS*** subsystems and data administration/data base management, subsequent to the completion of this plan, will follow the recently revised LCM process. It is anticipated that sometime during FY 91 the incremental development of the ***WFIS*** will be chartered as a project by the Program Project Review Board, chaired by the Assistant Director of Land and Renewable Resources. This will ensure that program needs are being met while maintaining consistency with the Target System development.

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Reporting and Uses

Each SO will track its ***WFIS*** implementation progress and provide the WO program staff with a semiannual report.

The intent of the ***WFIS*** is to serve as the primary source for Wildlife and Fisheries Program information and to be used for all program actions and reports. There will always be unique circumstances where that will not be possible, but these should be the exception. The 6501 Manual is scheduled for revision in FY 92. It will integrate ***WFIS*** and the many program reports to ease the field workloads and improve data consistency and accuracy.

Pilots and Tests

In FY 91, ***WFIS*** subsystems and their application in an LIS setting will be tested in New Mexico. In addition, the testing will include ***WFIS*** subsystems compatibility with other agency and organizational data systems to further the cause of standardization and improve data sharing. The latter will be targeted in New Mexico and Oregon because these two states' wildlife agencies are initiating data bases with assistance of the MSFWIS staff. A separate proposal to outline these efforts has been developed (Appendix 3).

Data Models and Data Flow

Data modeling is an important aspect of the Target System development and needs to be utilized for the ***WFIS*** to effectively be integrated into that system. Further work in this area will be expedited when the SC Project Management and Modernization Staffs are operational and ***WFIS*** is incorporated into future development plans. The results of the Enterprise Data Model will also be reviewed to ensure the interrelationships between data classes and processes are supported by the subsystems, data administration plans, and associated configuration decisions. The results of both EDM, recently completed, and the Mid-Level Analysis, completed in FY 90, will be incorporated into this plan in updates as needed. Table 7 shows an initial crosswalk of the functionalities developed in the EDM and the subsystems in ***WFIS***. In addition, a limited amount of data modeling using the Bureau standard Computer-Aided Software Engineering (CASE) tool (PROKIT), will be incorporated into the work of the second-round data set team dealing with the Wildlife Management data.

Table 7. Enterprise Data Model Crosswalk.

EDM Functionality	*WFIS* Subsystems
* Analysis	Population and Habitat Modeling Master and Working Map Files
* Inventory	Inventory/Monitoring (IHICS, TEDS, WORDS, RAIDS)
Financial Management	None
* Common Program Processes	Training, Investment Analysis, Program Statistics
* Human Resource Management	Personnel
* Budget Development	Annual Work Plan
Decision-Making	None
* Monitoring/Inspection	Monitoring
Compliance/Enforcement	None
* Regulation Development	None
Cadastral Survey	All
* Evaluation	Plan Tracking, HMPs
* Land Use Planning	Inventory
Mapping Sciences	Monitoring
Program Services	None
Administrative Appeals	None
* Information Management	Bulletin Board, Historical Notes Photo/Video Files
* Outreach	Public Contacts, Publications
* Plan/Project Development	Planned Actions
* Plan/Project Implementation	Habitat Development
BMT Operations	None
* Authorizations/Case Processing	None
* Legislation Development	None
* Conflict Resolution	Habitat and Population Modeling
Safety and Health	None

* Functionalities that apply to the Wildlife and Fisheries Program.

It must be realized that the subsystems are not equivalent to the functionalities because the subsystems are based more on data classes than functions. The crosswalk table shows preliminary relationships but will change dramatically in the Target System, because the current nonrelational data bases may become relational data tables with independent functional modules.

How Will We Know If We Have Achieved Our Goals?

Program Evaluation

Evaluation of the ***WFIS*** implementation process at the RA, DO, SO levels will be conducted as part of the ongoing Technical Procedures Review process for the program. Special attention will be given to the targets established by this plan and the state plans during the next 5 years where accomplishments are critical to Bureauwide program success. These evaluations will focus on data entry, data standards, use of DED, cooperative relations with other data system hosts, and subsystem application and use.

As mentioned above, each SO will be responsible for maintaining a record of the status of implementation and for providing annual reports to WO.

IRM Evaluations

WFIS subsystems will be evaluated from many different perspectives as part of the IRM evaluation process. These evaluations will concentrate on efficiencies, utilization, ADP procedures, and especially system security.

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Appendix 1

Overview of the Wildlife and Fisheries Information System

The Wildlife and Fisheries Information System ***(WFIS)*** is a four-part automated data system designed to aid Wildlife Program personnel, planners, and managers in the management of the public lands. The numbering system for the ***WFIS*** corresponds to the Bureau's Paperwork Management coding system.

The first part (6500 Series) is specifically designed to assist specialists, particularly at the DO, SO, and WO levels in the administration of the Wildlife and Fisheries Program. The 6500 series also includes several generic or miscellaneous data bases designed to fill specific needs of Wildlife Program specialists and managers. These generic data bases cross several series and are not specific to any one series, but are included in 6500 for convenience. The ***WFIS*** plan has tentatively identified 10 subsystems or data bases within this series (Table A1).

The second part (6600 Series) is designed to assist field-level specialists in the Wildlife and Fisheries Program, including special status species management. Three subsystems or data bases dealing with inventory and monitoring have been tentatively identified within this series.

The third part (6700 Series) stores basic information dealing with habitat management plans, habitat development and maintenance projects, tracking of public investments, identifying opportunities, and tracking accomplishments. The series currently contains five subsystems or data bases.

The fourth part (6800 Series) stores data on wildlife, fisheries, and botanical population management, particularly as they relate to threatened, endangered, or special status species. At the present time, the series has only two subsystems or data bases.

System interface between the various components of the ***WFIS*** (all four series) and between the field offices, RAs, DOs, SOs, and the WO will allow flexibility at the field level for data storage and retrieval while also providing necessary data to DOs, SOs, and WO.

The system has been designed to provide standard reports for recurring requests, such as the Annual Wildlife Statistical Report, Habitat Management Plan Annual Report, Public Land Statistics, etc. In addition, the system allows ad hoc queries of wildlife, fisheries, and special status species inventory and monitoring data bases.

On the administrative side, the 6500 series of the ***WFIS*** is made up of 10 separate data bases. The ***Personnel*** data base and the ***Wildlife Bulletin Board*** are completely developed and have been in use for several years. The user guides for these two systems will be prepared in FY 92. The ***Program Statistics*** data base has been in existence for several years. The remaining seven common or shared subsystems or data bases are anticipated to be part of the interim or Target System.

Table A1. *WFIS* Existing and Anticipated User Guide Series.

Administration 6500 Series	Inventory and Monitoring 6600 Series
Bulletin Board[2] (User Guide 6501-)	***Inventory***
Annual Work Plan[4] (User Guide 6501-)	***IHICS***[3] User Guide 6601-1)
Personnel[2] (User Guide 6501-)	***RAIDS***[1] User Guide 6601-2)
Program Statistics[1] (User Guide 6501-1)	***TEDS***[1] (User Guide 6601-3)
Public Contacts[4] (User Guide 6501-)	***WORDS***[1] User Guide 6601-4)
Training[4] (User Guide 6501-)	***Monitoring***[4] (User Guide 6601-)
Historical Notes[3] (User Guide 6501-)	***Habitat Modeling***[4] (User Guide 6601-)
Publications[4] (User Guide 6501-)	
Photo/Video Files[4] (User Guide 6501-)	
Working/Master Map Files[4] (User Guide 6501-)	

[1] Subsystem developed and user guide completed.
[2] Subsystem developed but no user guide.
[3] Subsystem currently under development.
[4] Subsystem still needs to be developed or will be part of the Target System.

Table A1. *WFIS* Existing and Anticipated User Guide Series (Cont'd).

Habitat Management, Development, and Maintenance 6700 Series	Population Management 6800 Series
Habitat Management Plans[1] (User Guide 6701-1)	**Special Status Species Tracking** (User Guide 6801-)
Planned Actions[3] (User Guide 6701-)	**Population Modeling**[4] (User Guide 6801-)
Investment Analysis Model[4] (User Guide 6701-)	
Habitat Development[2] (User Guide 6701-)	
Plan Tracking[4] (User Guide (6701-)	

[1] Subsystem developed and user guide completed.
[2] Subsystem developed but no user guide.
[3] Subsystem currently under development.
[4] Subsystem still needs to be developed or will be part of the Target System.

The 6600 series of the ***WFIS*** is currently made up of three separate data bases with the first, ***Inventory***, being further divided into four subsystems/data bases—Integrated Habitat Inventory and Classification System ***(IHICS)***, Riparian Aquatic Information Data System ***(RAIDS)***, Threatened and Endangered Species Data System ***(TEDS)***, and the Wildlife Observation Report Data System ***(WORDS)***. User guides for ***RAIDS***, ***TEDS***, and ***WORDS*** are found in the first release of the 6500-6800 Series ***WFIS*** User Guide. The user guide for ***IHICS*** is scheduled to be released the second half of FY 92. Two additional data bases, ***Monitoring*** and ***Habitat Modeling***, are scheduled for release in FY 92.

The 6700 series has five subsystems or data bases at the present time. ***Habitat Management Plans*** is developed and has been in use since 1987. The ***Investment Analysis Model*** and ***Habitat Development*** are systems that are already in existence and use within the Range Program; however, user guides and software development are undergoing revisions. Once final, these two subsystems will be shared by ***WFIS***. ***Planned Actions*** and ***Plan Tracking*** are both under development with user guides also scheduled for release in late FY 92.

The 6800 series has two subsystems or data bases at the present time, ***Special Status Species Tracking*** and ***Population Modeling***. The ***Special Status Species Tracking*** data base is currently under development, with the user guide scheduled for release in late FY 92.

Since some components of the ***WFIS*** will only work on a mainframe and others will work on both mainframe and personal computers, the ***WFIS*** will be implemented using both. It is anticipated the ***WFIS*** will use the Honeywell DPS-8 and possibly a PRIME (Level A) during the interim period. These machines will serve the need for a centralized data server, while PCs will serve the need for decentralized data servers.

To accomplish the above, at least during the interim, the ***WFIS*** will develop user guides for all subsystems as identified in Table A1. User guides for each of the ***WFIS*** subsystems which are best suited for personal computer applications will be released with IBM-compatible (360K) diskettes. User guides for ***WFIS*** subsystems which lend themselves equally to mainframe and personal computer applications will also be released with diskettes, as well as being available on the mainframe. ***WFIS*** subsystems which lend themselves only to mainframe applications will have user guides developed, but will **not** be accompanied by a diskette.

Currently, the interim data base manager for the ***WFIS*** system is the PC and Mainframe versions of ASPEN/2. ASPEN/2 is the only Bureau-approved data base manager software that works on both mainframes and personal computers. ASPEN/2 has some limitations that are recognized. However, many of these limitations can probably be corrected. As the Bureau moves toward the Target System, the data base manager (software) and hardware will most likely change.

Appendix 2

Detailed Description of *WFIS* and Other Shared or Common Subsystems

12 *WFIS* Interim and Target Subsystems

Subsystem: ***Inventory (IHICS, RAIDS, TEDS, WORDS)***

Background: This existing subsystem is for storing and retrieving wildlife and fisheries habitat inventory data. It currently consists of four components: Integrated Habitat Inventory and Classification System ***(IHICS)***, Riparian and Aquatic Inventory Data Summary ***(RAIDS)***, Threatened and Endangered Data System ***(TEDS)***, and Wildlife Observation Report Data System ***(WORDS)***. Data is used almost exclusively by RA and DO program personnel, with minimum use by SO, SC, and WO program staffs and managers. The possibility exists to include other components based on field inventory data base needs within this subsystem (i.e., raptor nest site and spotted owl data bases).

Function: Wildlife and fisheries input into the Bureau's planning system (EAs, EISs, RMPs, HMPs); analysis; input to non-Bureau EISs; information for state fish and game agencies; and support of management decisions.

Frequency: Hard to determine frequency of use. Data must be available, but not necessarily "on-line" at all times.

Size: Existing data files would require 20 megabytes on a PC or 20,000 little links on the SC mainframe. These figures represent approximately 10 percent of Bureau acreage. Thus, eventual size could be greater than 200 megabytes.

Description: An index of ***WFIS*** files on the Honeywell DPS-8 is available by accessing (WILD/LIFE/WFISINDEX).

Input: RA and DO program personnel.

Type of use: Inventory data is used in all four areas below:

- **Direct Use:** In-house, interactive queries once a file has been established.
- **Data Sharing:** Data is shared among field offices, Forest Service, Fish and Wildlife Service, The Nature Conservancy's data base, etc.
- **Archiving:** One of the most important functions of SC data base.
- **Summary to Higher Level:** The original intent of IHICS was to provide an information source that could be summarized at higher levels for analysis purposes.

Processing needs: Existing error edits by mainframe to ensure minimum data standards and standard mathematical, statistical manipulation.

Output: Data for ad hoc queries; input to ***Habitat Modeling, Plan Tracking, Planned Actions, Management Plans, Habitat Development***; and standard business graphics.

Subsystem: ***Program Statistics***

Background: This is an existing data base that is proposed to be a repository for wildlife statistical data. This data is used in the Annual Wildlife Report/Status Report, in the Forest Service's RPA Report, and in other special reports as required. In the past, there has been no standard place for archiving these types of statistics and, in addition, many of these statistics are not even collected for some Districts or

are not collected on a regular basis. This subsystem would be used primarily by SOs and WO with data input by the RAs and DOs.

Function: To detail numbers of various wildlife species or groups, the trend of those populations, harvest numbers, if applicable, current status and trend of habitats located on public lands.

Frequency: At least annually, more often depending upon special requests.

Size: 1 megabyte on a PC and/or 100 little links on the Honeywell DPS-8 mainframe.

Description: Available on the Honeywell DPS-8 through (*) WILD/LIFE/STATS__.ASP. Data available in separate files for FY 87 and FY 88.

Input: Data comes from the field based on inventory and observation information and from state wildlife management agencies.

Type of use: Used directly by RAs, DOs, and SO biologists, Wildlife Program leaders, SC program personnel, and WO program personnel.

This data, shared by all personnel listed above, is archived at some accessible, central location so that historical information is not lost and can be retrieved quickly.

Summaries of the data from the RA and DO levels, and used by SO, SC, and WO personnel in briefing papers and other types of reports.

Processing needs: Statistical summaries and query capability are all that are needed for this data base.

Output: Used for input to national assessment reports, such as the Public Land Statistics, Annual Wildlife Report, Annual Status Report, including standard business graphics. It would be linked to ***Inventory, Monitoring, Habitat Development, and Habitat Management Plans***.

Subsystem: *Habitat Management Plans* (ACECs, CRMPs, HMPs, Sikes Act HMPs, Cooperative Agreements, CMPs, Others)

Background: This is an existing data base that stores basic statistics on habitat management plans such as target species, funds spent, money contributed, and funds required for complete implementation.

Function: This data base is used continually as a source of information from which responses are made to Congress, Bureau management, and the public on the Bureau's Habitat Management Program/Sikes Act Implementation. Budget justifications, AWP planning, and tracking are other valuable uses.

Frequency: At least annually; frequently by DO and SO program personnel.

Size: 1 megabyte on PC and/or 500 little links on the Honeywell DPS-8 mainframe.

Description: Available on the Honeywell DPS-8 through (*) WILD/LIFE/HMPFY__.ASP. Data available in separate files for fiscal years 86-90.

Input: District and State Offices.

Type of use: Interactive submission of data, queries, and reports by WO, SOs, and DOs. Very little data sharing occurs because of the type of data. RA and DO program personnel use the data base to determine whether other HMPs have been prepared for unique or unusual species. Summary statistics can be used for various annual reports, budget justifications, etc.

Processing needs: Link to GIS/LIS/Master Map Files.

Output: Annual Wildlife Report; input from ***Annual Work Plan, Planned Actions, Plan Tracking, Program Statistics*** and other reports; Annual Status Report; including business graphics.

Subsystem: *Personnel*

Background: This is an existing data base used to track and store selected data about personnel in the Wildlife and Fisheries Program. The system is used at all levels of the Bureau.

Function: Program personnel use it to track other biologists/botanists. DO and SO program leaders use it to create lists of biologists by State/District. WO wildlife staff use it in a similar manner, but also to monitor trends in staffing (i.e., number of wildlife biologists, fisheries biologists, botanists; by grade; by state). Mailing lists are developed from this subsystem to send program personnel certain information. It is also used to produce a printed telephone directory of Wildlife and Fisheries Program personnel for both internal and external distribution.

Frequency: Only occasional use is now being made of this subsystem or data base. When the field becomes aware it is available on both the DPS-8 and PCs, and that it is current, it will be used frequently.

Size: 50 kilobytes on PC; 60 little links on Honeywell DPS-8 mainframe.

Description: Available on the Honeywell DPS-8, under the user ID, catalog and file name, WILD/LIFE/PERSONEL_.ASP.

Input: SO program leaders and ad hoc from program personnel through SC.

Type of use:

- **Direct Use:** Is used by all Bureau program personnel.
- **Data Sharing:** Is used in the annual WO Fish and Wildlife Program Report.
- **Archiving:** Annually to identify long-term trends in Wildlife Program personnel.
- **Summary to Higher Level:** None.

Processing needs: None, other than standard data base manipulations, e.g., sorting, counting.

Output: Annual Program Status Report; input to ***Annual Work Plan, Training, Program Statistics***; and the production of standard business graphics.

Subsystem: *Habitat Development*

Background: This ***WFIS*** subsystem would be linked to the Rangeland Information System, ***RIPS*** subsystem, and would be used to track wildlife and fisheries funded projects. Data from the ***RIPS*** system would provide this data, which in turn would temporarily become part of ***WFIS***'s ***Habitat Development*** subsystem. ***WFIS*** would tie all the data subsystems together in order to provide required data for the Public Land Statistics and the annual WO Fish and Wildlife Program Report. RA and DO program personnel would enter data, while all levels would have access to the data.

Function: Track money expended, and money needed for construction and maintenance of wildlife projects, by species, type of project, etc.

Frequency: Annually, as required. Ad hoc queries by all offices.

Size: Estimated to be 10 times as large as the HMP data system (2.0 megabytes) or 1,800 little links on SC mainframe.

Input: Input through ***RIPS*** and direct input by RA and DO program personnel.

Type of use: In-house data sharing; annual archiving to provide historic data. Certain data elements will be selected to provide data for automatic data transfer to the ***Program Statistics*** subsystem.

Processing needs: None other than normal data base management system functions, e.g., summaries, sorts.

Output: Input to ***Annual Work Plan, Habitat Management Plans, Investment Analysis Model,*** Annual Program Status Report, and the creation of standard business graphics.

Subsystem: *Investment Analysis Model*

Background: Procedures for estimating and documenting wildlife population responses to management for use in economics analyses have been developed and are being incorporated into a manual. This data base automates the procedure for completing the "limiting factors worksheet" through the Investment Analysis Model. The system is used by RA and DO program and nonprogram personnel.

Function: To compare costs and benefits of projects and to document such analyses.

Frequency: Daily to monthly by RA and DO program personnel.

Size: Estimated at 500 kilobytes to 1 megabyte depending on number of files.

Input: Field Offices.

Type of use: Processing of alternate economic analyses and archiving of them.

Processing needs: Standard mathematical and statistical functions.

Output: Benefit cost ratios for all types of rangeland improvement projects. Ranking and setting priorities for habitat development projects and net economic benefits from projects to local communities. Changes in populations and harvest due to a specific/proposed action. Input to ***Populations*** and ***Habitat Modeling.***

Subsystem: *Special Status Species Tracking*

Background: This would consist of a summary of current information on legal and biological status of threatened, endangered, or candidate species on public lands. The system would be used by all program personnel, State Directors, FWS, state wildlife management agencies for annual wildlife reports, EISs and EAs, and other reports as needed. This subsystem would share data with the FWS and The Nature Conservancy.

Function: Assists program personnel in the preparation of briefing papers, public affairs materials, and other documents as listed above.

Frequency: At least annually, more often depending upon frequency of requests.

Size: Probably very large, 1-5 megabytes on a PC.

Input: Data comes from the field based on inventory or observation information, and from changes in status determined by the Fish and Wildlife Service.

Type of use: Direct use by RA and DO program personnel.

Data from the RA/DO level should be accessible, at least by the SO, SC, and WO program personnel.

These data will be archived at some accessible, central location so that historical information is not lost and can be quickly accessed if needed.

Summaries of these data from the RA/DO level are used by SO, SC, and WO program personnel in reports and briefing papers.

Processing needs: Statistical summaries and query capabilities.

Output: Used to provide input to the Annual Program Status Report, ***Monitoring*** and ***Program Statistics***, including standard business graphics. Would also export data to other agencies/interest groups.

Subsystem: *Planned Actions*

Background: This subsystem is currently under development and will be used to track planned actions and accomplishments at the activity plan level. It would include planned projects as well as studies, introductions, cooperative positions, research, MOUs, access acquisitions, etc., that are part of the Wildlife and Fisheries Program. Physical projects would also be documented as part of ***RIPS***. This subsystem will also be used to track the Challenge Cost Share Initiative. The system will track public contributions of money, materials, and labor to the Bureau Wildlife and Fisheries Program. The system would be used by all field office program personnel and program leaders in SOs, SC, and WO.

Function: To track contributions and ensure that individuals and organizations are appropriately acknowledged. For higher level summaries, including annual reports, etc.

Frequency: Unknown at present.

Size: Probably between 1-5 megabytes on a PC.

Input: Field Office program personnel.

Type of use: Used directly and summarized to higher levels, for annual reporting, etc.

Processing needs: Query capability; summary reporting.

Output: Annual Program Status Report; input to ***Program Statistics*** and representation of data by means of standard business graphics.

Subsystem: *Plan Tracking*

Background: This will be a new system to track or monitor progress toward meeting any type of plan objectives including RMPs, EISs, HMPs, strategic plans, Fish and Wildlife 2000, Recovery Plans etc., specific to the Wildlife and Fisheries Program. It would be used at all levels of the Bureau.

Function: Justify AWP requests, WO Fish and Wildlife Program reports, and plan and analyze program productivity.

Frequency: Annual report, ad hoc queries.

Size: Estimated at 1 megabyte or 900-1,000 little links on the SC mainframe.

Input: Direct from the RA and DO.

Type of use: Data would be shared with other programs; annual archiving to record historic data; summary at SO and WO level to show program progress.

Processing needs: Minimal.

Output: Input to ***Annual Work Plan, Inventory, Monitoring, Planned Actions, and Program Statistics.***

Subsystem: *Monitoring*

Background: Large amounts of wildlife, fisheries, and special status plant data are gathered each year as part of the monitoring program. In many cases, these data are collected, filed, and forgotten, or are of limited use. A system of storage, retrieval, and analysis is needed to make effective use of these data.

The same situation applies to range and watershed data. The data are essential in determining trends in conditions and measuring the effectiveness of management activities or past projects/developments/ authorizations.

Function: To determine if management objectives are being met, and to schedule the timing of conducting monitoring efforts.

Frequency: Variable, at least the time period between monitoring studies.

Size: Unknown and highly dependent on the resource values and complexity of the issues within each RA or DO.

Input: Direct input by RA and DO program personnel. Data comes in from field biologists and botanists based on baseline inventory and subsequent monitoring efforts on wildlife and fisheries projects as well as other program actions.

Type of Use: Used directly by RA and DO program personnel and managers, as well as SC and WO program personnel for briefing papers and annual reports, etc. Data should be archived so that important historical data is not lost and can be quickly accessed.

Processing needs: This subsystem will require mathematical and statistical manipulation of the data.

Output: Outputs and data sharing would be between the following subsystems: Annual Program Status Report, monitoring reports, special ad hoc queries by Congressional staffs and outside interest groups, ***Habitat Modeling, Inventory, Planned Actions, Plan Tracking, Program Statistics***.

Subsystem: *Habitat Modeling*

Background: The data base will consist of three parts. Part I would be modeling software, to make modeling easier for program personnel. Part II would consist of a library of existing models. Part III would consist of an archive of models used and historical predictions made using such models. RA and DO program personnel in field offices would use the system.

Function: Habitat models are used to make predictions about impacts of management actions on wildlife habitat. Such predictions are needed in developing RMPs and HMPs with site-specific actions; in EAs and EISs, in analyzing projects; and for input into all economic analyses.

Frequency of use: Daily to weekly.

Size: Could be very large, up to 5-10 megabytes on a PC.

Input: Part I would be developed with the data base. Parts II and III would be provided by the field offices. Part I could require input from ***Master Map Files, Inventory, and Monitoring***, and would use ***Working Map Files***.

Type of use: Part I would be used directly by program personnel. Models and predictions archived in Parts II and III would be accessible for other program personnel to examine.

Processing needs: Part I would require full use of supporting mathematical and statistical functions.

Output: Model predictions would provide input into ***Population Modeling, Investment Alalysis, and Planned Actions.***

Subsystem: *Population Modeling*

Background: Fish and Wildlife 2000, each associated strategic plan, state level Fish and Wildlife 2000 plans, RMPs, HMPs, and recovery plans often include objectives dealing with animal or plant population numbers. These plans are often for reintroduction, recovery, or consumptive use objectives. Program personnel have a need for a model which can be used in analyzing alternatives even

though other agencies may have the primary species management responsibility, except, of course, for special status plants.

Function: The system would model plant or animal populations based on ecological and demographic information/factors from inventory and literature. The predictions are used in Bureau plans, EAs, EISs, and in proposal analysis.

Frequency: The use would be frequent at times, but not constant; perhaps several periods of use during a year for any one office.

Size: Unknown, but models can be large and/or complex.

Input: Standard demographic, environmental, ecologic, and genetic variables, from inventory, monitoring, or literature.

Processing Needs: The model would logically consist of two parts, a data component and a processing/output component. The data component would include the input variables and assumptions, while the processing/output part would include the processing code and output data for various situations.

Output: The outputs would include population factors/variables parameters such as numbers by age class, distribution, mortality rates, reproductive rates, population growth rates, etc. This subsystem would be linked to other subsystems such as ***Habitat Modeling, Inventory, Monitoring, Investment Analysis Model.***

8 Shared or Common Subsystems that are Required by WFIS

Subsystem: *Annual Work Plan*

Background: This system will automate the packaging, programming, and budgeting process. It would be used by program personnel at all levels for AWP development, monitoring and analysis.

Function: Programming, budgeting, and accounting.

Frequency: At least monthly.

Size: Probably less than 1 megabyte on a PC.

Input: Field Office/SO/WO.

Type of use: Direct use at all levels. Data from field offices would be aggregated to higher levels where they would be edited and adjusted. No long-term archiving would be necessary.

Processing needs: Minimal arithmetic processing such as summing.

Output: Budget Reports; Annual Wildlife Report; input to ***Habitat Management Plans, Projects, Statistics,*** including business graphics.

Comments: This should be part of a system (Federal Financial System) to automate the entire budget process, not just the Wildlife Program.

Subsystem: *Bulletin Board*

Background: The wildlife bulletin board allows electronic messages to be sent and received by any wildlife biologist or other program personnel from any office in the Bureau with access to the SC mainframe computer. This functionality will most likely be part of the Target System. There may be a possibility, with appropriate Bureau approval, that the mainframe bulletin board could be eliminated and the existing capabilities of CompuServe used instead. This would save space on the mainframe, and may also result in increased use by program personnel.

Function: It is used for short-term communications: inquiries, announcements of meetings, job opportunities, publications, etc. This system will currently

allow program personnel to send, receive, recall, and edit previous messages for private or predefined group use, and print messages on hard copy.

Frequency: Very little at present. Designed to be used routinely (daily to weekly) by all Wildlife Program personnel.

Size: The message itself may be more than one terminal screen in length. The ***Bulletin Board*** file on the Honeywell is less than 1,000 little links.

Input: Program personnel Bureauwide.

Type of use: Primarily used for sharing information. Messages are automatically purged after 30 days. Archiving is not necessary or desirable.

Processing needs: Minimal; more frequent use by the field would help determine the pitfalls and shortcomings of the system. The primary need is making the bulletin board simple, easy, and quick to use.

Output: Immediate display or hard copy printouts.

Subsystem: *Historical Notes*

Background: A need has been identified for a system of storing and retrieving important narrative or other information about wildlife resources that doesn't neatly fit into existing data bases. Examples include reports of site visits, comments from "old-timers" about historical wildlife abundance, important information from state wildlife agency reports, etc. This data base was primarily conceived as a resource management subsystem; however, it might also be applicable to program management. For example, verbal agreements with fish and game agencies could be documented. The data base would consist of a variable-length, free-format text, with a more rigid, structured system for identifying key words for retrieval. Retrieval could be by author, key word/subject, date, location, species, or other topics as identified. This data base could also serve as a repository for raw data. The system would be used by all program personnel at the field level, with some use by the SO, PTC, SC, and WO program personnel. The system should also be available to other resource specialists as well.

Function: Storage and retrieval of historical data and information on wildlife resources.

Frequency: Variable; daily to monthly.

Size: Unknown, but would likely be large, possibly extremely large.

Input: Program personnel at the field level would provide input. Any wildlife-related record worth saving, but not entered into another system, would be put into this system.

Type of use: Program personnel would use the subsystem directly for reports. Archiving would be essential for this subsystem's long-term storage. New program personnel could use the system to become informed on resource values and history when transferred to a new position.

Processing needs: None.

Output: Strictly a text storage/retrieval system; use of information from this system would have to be synthesized prior to using it in another subsystem such as ***Inventory, Monitoring, Population, and Habitat Modeling.***

Subsystem: *Public Contacts*

Background: This subsystem will consist of a data base of individuals, organizations, and other state and Federal agencies that program personnel need to contact to exchange information. It would be used by Wildlife and Fisheries Program personnel at all levels, as well as by other personnel, such as area managers and public affairs officers.

Function: Document personal contacts (phone calls, visits), serve as a telephone directory, and generate mailing lists.

Frequency: Daily.

Size: Probably very small, less than .5 megabytes for each office.

Input: Individual users would develop and maintain their own lists for their area of responsibility, e.g., area biologists for area contacts. Standardized formats would allow program personnel moving to new offices to use existing lists.

Type of use: Primarily used by program personnel generating information for their use and for their successors. Some data sharing by other specialists and managers.

Processing needs: None, other than normal data base management system functions, e.g., summaries, sorts.

Output: Creation of directories, lists, mailing labels, and representation by standard business graphics.

Subsystem: *Publications*

Background: Numerous publications are produced and distributed by personnel in the Bureau's Wildlife and Fisheries Program. These range from Open-File-Reports that are primarily archiving documents, to papers in professional journals, and internal Bureau technical publications. A system for tracking open file reports or "gray papers or publications" needs to be developed so that other program personnel both within and outside the Bureau are aware of the information. The system would be used by all program personnel at all levels of the Bureau. The SC on-line card catalog system that should be operational during FY 91 could be modified to include this function.

Function: Current awareness of new information. Retrieval of relevant historical information and cataloging of unpublished professional papers.

Frequency: Unknown.

Size: Unknown, but probably small.

Input: Program personnel within the Bureau would submit publications. Centralized input and management, probably by SC.

Type of use: Direct query use by program personnel at all levels. Summary statistics on numbers of publications, etc., for annual reporting.

Processing needs: Query capability, report generation, and summaries.

Output: Limited statistics and listings for Annual Program Status Report; input to ***Program Statistics***; listing of new and current publications transferred to ***Bulletin Board***.

Subsystem: *Training*

Background: This would be a system for displaying, scheduling, and tracking training. Program personnel should be aware of wildlife and related cross training that is scheduled and available, along with necessary administrative information (costs, prerequisites, etc.). It would be used by program personnel, managers, and supervisors at all levels of the Bureau. This ***WFIS*** subsystem would actually be a component of several other existing subsystems, one of which tracks completed training within the PAY/PERS system.

Function: Current awareness of traditional in-house training opportunities and availability, as well as outside training courses.

Frequency: Variable.

Size: Small.

Input: Coordinated by the Phoenix Training Center.

Type of use: Direct use by program personnel for current awareness.

Processing needs: Only query capability and limited summaries.

Output: Limited statistical summaries (number of courses, number of attendees, etc.) to Annual Program Status Report, and other administrative reports.

Subsystem: *Photo/Video Files*

Background: Photographs often contain useful information. The Bureau uses photographs for recording existing landscape conditions, documenting events such as trespass activities, and many other purposes. Pictures are most useful, however, when they are used in conjunction with other information. Thus, a system is needed for storing pictures that can be integrated with other systems for storage, retrieval, and use of alpha-numeric and geographic data. Videodisc technology now has the capability to store up to 50,000 images (slides) on a single disk with random access computer retrieval. Such video files would be used by program personnel at all levels of the Bureau in conjunction with other data bases such as ***Working and Master Map Files, Inventory, and Monitoring.***

Function: The system would simply function for storage and retrieval of the visual components of other systems.

Frequency: Daily to weekly depending upon the office and current activities.

Size: Current video disc technology is not digital; therefore, size estimates in terms of bytes cannot be made. One videodisc can store up to 50,000 images.

Input: Video files would be produced from existing pictures and accompanied by a picture catalogue file with appropriate date, location, and other reference criteria.

Processing Needs: The only processing required would be retrieval according to appropriate date, key word, location, or other reference.

Output: Output would consist of display of the picture retrieved on a video screen.

Subsystem: *Working/Master Map Files (Habitat Maps, GIS Master Files)*

Background: The Geographic Information Systems in the Bureau use a software package entitled Map Overlay and Statistical System (MOSS). The MOSS work files may be thought of as new or working maps that are created by the manipulation of the MOSS master files. These working maps are typically the result of modeling, conflict analysis, etc., that have created new information from the existing master map. This data is typically discarded after the analysis is completed. Working maps may be updated and changed only through specified permissions.

Typically the master set of habitat maps would show habitat sites, standard habitat sites, and special habitat features.

The majority of application work will be in the RA by program personnel. However, spatial data can be aggregated by higher levels of the Bureau organization, as well as by the public, other agencies, and resource managers.

Function: Data are used for HMP, RMP, EA, EIS preparation or any action that requires conflict analysis for resource plan mitigation. Also, the spatial data may provide a central focus for capturing, maintaining, and standardizing map data for the Bureau into a common library. With the emerging LIS approach the Bureau is adopting, the MOSS working/master files will provide the graphic component for the display of data currently in ***WFIS***. Master maps, however, would seldom be used directly; normally

all or portions of master maps would be copied onto a working map.

Frequency: The data bases in each RA would be used daily by program personnel processing an EA, Mineral Clearance, or some other analysis requiring wildlife, fisheries habitat, or special status species spatial data.

Size: Size of working/master maps depends on the number of map themes. However, the average size of a RA spatial data base for wildlife programs will be in the neighborhood of 20 to 40 megabytes.

Input: The MOSS master data may come from a variety of sources, ranging from remote sensing to field mapping. The data typically is derived from field mapping transcribed to orthophoto or topographic quadrangles, then digitized (using the Automated Digitizing System) and then converted to the spatial data MOSS master files for analysis. Working map files would normally be created by making a copy of all or portions of master map files.

Type of use:

- **Direct Use** - In-house, interactive queries once a file has been established. Use by all program personnel is expected.

- **Data Sharing** - As experienced in a number of GIS projects, data may be transferred to and from other agencies (e.g., USFS in the Grizzly Bear Habitat study in Montana) for their analyses. However, more importantly the data sharing with other resource disciplines in Bureau analyses is probably the most cost/beneficial for managers to complete the daily workload of EA, EIS type of conflict analysis workload.

- **Archiving** - Periodic archiving of master map files is necessary. This is the weakest feature of the MOSS family of software. There are no readily available methods to archive the MOSS data. However, with the GIS is beginning to improve upon this weakness.

- **Summary to a Higher Level** - Maps can be aggregated to cover larger geographical areas. This is a simple function of the MOSS family of software. By merging maps, summarizing data through statistical analysis, etc., data may be passed up through the organization.

Processing needs: The Wildlife and Fisheries Program has requested a number of models, macros, etc., that have not been funded nor developed by the Bureau. The FWS has these models and Bureau staffs are investigating the transfer of this software to Bureau MOSS. The MOSS software has a statistical package incorporated for statistical analysis. Also, the RDBMS should become part of the ***WFIS***.

Output: Currently, there are no other data bases to export the results of the MOSS master map analysis. However, alphanumeric data as a result of map analyses may need to be transported to other files. For example, the processing of the acreage tabulations in GIS may be transferred to the ***IHICS*** data file to update antiquated acreage tabulations currently in the data base. Similarly, map data may be used to develop models in ***Habitat and Population Modeling.***

As a result of the MOSS master map analysis, hard copy maps may be generated for publication, public meetings, RMPs, field sheets for inventory and mitigation, etc.

Comments: The MOSS master files will be a means of displaying map data to a terminal screen or onto a hard copy map. To tie this data to other alphanumeric data would provide the modeling, the query, and report generation capability that field offices require.

Appendix 3

Proposal for Integration of Fish and Wildlife Data Systems

Issue: Integration of fish and wildlife data systems between BLM, USFS, FWS, State Fish and Wildlife agencies, and The Nature Conservancy.

Background: Over the past decade, numerous agencies and conservation organizations have developed and implemented information systems. These usually consist of flat file data bases to store and retrieve wildlife, fisheries, and special status plant data. This has resulted in substantial duplication and, at times, even competition between systems. The effect has been that many systems exist that meet only part of the overall data and analysis needs of the agency, resulting in each entity struggling to unilaterally fund their own efforts.

In the early 1970's, it became increasingly apparent that national and state agencies and organizations had overlapping needs for fish and wildlife information. This concern led to the creation of a five-way agreement between FWS, BLM, USFS, SCS, and USGS that was aimed at standardizing and coordinating the collection and classification of inventory data. The intentions were laudable and top level management signatures seemed to ensure success. But limited technology, mainframe mania, and entrenched independence led to the situation described above. Limited efforts have continued during the intervening years to at least coordinate between the organizations and agencies, and in some areas a great deal of this effort has centered around the Multi-State Fish and Wildlife Information System Project. Even with this sporadic, narrow scope, attempts at standardizing the many and varied nonstandardized data bases, systems, and data definitions have dotted the map in the field of fish and wildlife management. And while all this was happening, fish and wildlife specialists have come to realize that the potential benefits, budget pressures, individual successes, and refined technology have created a new opportunity.

Proposal: To facilitate data sharing, reduce duplication, and improve cooperation, we propose the development and testing of methods to integrate the wildlife and fish data systems, data bases, and data elements in two states. The test would involve BLM, USFS, FWS, state fish and wildlife agencies, MSWFIS Project, The Nature Conservancy, and any other agency or organization with data or interest. The targets for the test are New Mexico and Oregon, which have state agencies that have indicated an interest in such an effort and are in the process of installing fish and wildlife data bases. The overall proposal would be conducted by the MSFWIS Project staff under agreement with BLM and other agencies as necessary. Primary support would come from the state wildlife agencies, BLM field offices, and SC. Support from other participants and the details of funding will be determined at the scoping meetings and through agreements. The total anticipated costs are estimated to be $30,000 primarily to cover nonsalary expenses and would most likely be spread over 2 fiscal years. The following tasks would be included:

1. Set up interagency meetings at the national level and in each state to brief representatives on plans and objectives, get input on the proposal, and determine levels of participation and support.

2. Prepare a general work plan including schedule, cost estimates, participants, assignments, methods, and assumptions. The project could span 2 years.

3. Prepare and execute necessary agreements at the national and state level addressing intermediate products and reports, schedules, responsibilities, and funding.

4. Survey and inventory current data systems and data elements using an approach similar to the BLM data standardization process. Identify general user needs for each of the participants, where that has not already been done, in order to design the integration.

5. Design an integration scheme that will allow data sharing between the systems and agencies, incorporating hardware and software in use or prescribed by each participant. For BLM, the software will be Oracle and the hardware will be IBM-compatible PCs. The scheme must be consistent with BLM's LIS development and procurement process.

6. Test the integration in the two states using data and platforms specified by the participants. This test could encompass the entire state or be limited to a specific geographic area or land base. An evaluation report will be prepared and presented to the participants.

7. Develop user guides and training materials reflecting the approved integration/data sharing methods for use by any or all participants.

8. Propose configuration and system administration techniques for the participants to facilitate integration/data sharing.

Benefits: This proposal would take advantage of an opportunity to achieve an increased level of standardization and integration of fish, wildlife, and plant data which has been a long-standing need recognized by many agencies and organizations. Specific benefits include the following:

1. Take advantage of standardization from the bottom up and test it at the state level, the common denominator for most fish and wildlife activities.

2. Provide access and use of other organization's data while maintaining the legal responsibilities and areas of interest in the maintenance and operation of the separate data systems.

3. Provide the ability to track and aggregate planning documents between agencies. Our inability to do this has been a long-standing problem in fish and wildlife management.

4. Take advantage of each agency's special skills and capabilities; for example, BLM's vegetation, land, minerals, survey, and spatial data systems, FWS coverage of T/E data, TNC's sensitive species and habitat information, state agencies population management data including private lands, etc.

5. There is certainly a great potential benefit to other agencies and the public in having consistent and accessible data. Some of these are environmental and planning consultants, oil and gas companies, utility companies, the timber industry, local government planning bodies, conservation and sports groups, range users, and the general public. Because BLM's Target System will provide some level of public access to our data, these potential users will benefit substantially. Fish and wildlife information is the subject of diverse and frequent inquiries, and is at the center of many resource/planning issues.

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Potential Systems to be Evaluated:

Wildlife and Fish Information System (12 subsystems)	BLM
Endangered Species Information System	FWS
Heritage Data Bases, NM, OR	TNC
State Species Data Bases, NM, OR	NMDGF, ODFW
Habitat and Population Models	FWS, NMDGF, ODFW

Appendix 4

List of Abbreviations and Acronyms

ACEC	Area of Critical Environmental Concern
ADP	Automated Data Processing
ALMRS	Automated Land and Mineral Record System
ARD	Automated Resource Data
ASCII	American Standard Code for Information Interchange
AWP	Annual Work Plan
CASE	Computer-Aided Software Engineering
CRMP	Coordinated Resource Management Plan
DED	Data Element Dictionary
DO	District Office
DPS	Data Processing System
DRD	Detailed Requirements Definition
EA	Environment Assessment
EDM	Enterprise Data Model
EIS	Environmental Impact Statement
EMS	Electronic Mail System
FWS	Fish and Wildlife Service
FY	Fiscal Year
GABS	Grazing Authorization and Billing System
GCDB	Geographic Coordinate Data Base
GIS	Geographic Information System
HMP	Habitat Management Plan
IBM	International Business Machines
IHICS	Integrated Habitat Inventory and Classification System
IRM	Information Resource Management
IRMRC	Information Resource Management Review Council
JDR	Job Documentation Report
LCM	Life Cycle Management
LIS	Land Information System
MF	Mainframe
MOSS	Map Overlay & Statistical System
MOU	Memorandum of Understanding
MSFWIS	Multi-State Fish and Wildlife Information System
NMDGF	New Mexico Department of Game and Fish
ODFW	Oregon Department of Fish and Wildlife
PAY/PERS	Payroll/Personnel System
PC	Personal Computer
PLS	Public Land Statistics
PTC	Phoenix Training Center
RA	Resource Area
RAIDS	Riparian Aquatic Information Data Summary
RDBMS	Relational Data Base Management System
RIPS	Rangeland Improvement Projects System
RIS	Rangeland Information System
RMP	Resource Management Plan
RPA	Resource Planning Act
SC	Service Center [Denver]
SCS	Soil Conservation Service
SIP	Software Improvement Process
SO	State Office
SQL	Structured Query Language
TEDS	Threatened and Endangered Species Data System
TNC	The Nature Conservancy
USFS	United States Forest Service
USGS	United States Geological Survey
WFIS	Wildlife and Fisheries Information System
WO	Washington Office
WORDS	Wildlife Observation Report Data System

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